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European Technical Assessment ETA 24/0589 of 05/08/2024

I General Part

Technical Assessment Body issuing the ETA	**Eurofins Expert Services Oy**
Trade name of the construction product	**HELKA® column shoes**
Product family to which the construction product belongs	Column shoes
Manufacturer	**Peikko Group Corporation** **P.O.Box 104, 15101 Lahti, Finland**
Manufacturing plant	Peikko Manufacturing Plants (Annex N)
This European Technical Assessment contains	12 pages including 8 Annexes, which form an integral part of this assessment and a separate Annex N.
This European Technical Assessment is issued in accordance with regulation (EU) No 305/2011, on the basis of	EAD 200102-00-0302 Column shoes for structural connections of reinforced concrete columns

II Specific Part

1 Technical description of the product

HELKA® column shoes, illustrated in Figure A1 and A2 of Annex A1, are connectors made of structural steel (EN 10025) and reinforcing steel bars (EN 1992-1-1). The components of a column shoe are connected to each other by welding.

The column shoe comprises a horizontal part called base plate, a vertical side plate, vertical main anchorage bars and bent rear bars. There may also be thin, non-structural steel plate that serve as moulds when concreting the column.

The geometry and dimensions of the column shoes are presented in Annex A2. The steel materials and requirements are specified in Annex A3.

2 Specification of the intended uses in accordance with the applicable European Assessment Document (hereinafter EAD)

Intended uses

The column shoes serve as connectors between a concrete column and foundation or beam or between two columns. They are inserted inside the hoop reinforcement at the lower end of a column before concreting. After hardening of the concrete the column is installed in its final position. The column shoes are fixed with nuts and washers to anchor bolts that have previously been concreted to the supporting lower structure. The space between the end of the column and the supporting structure as well as the recesses for the nuts are grouted with non-shrink grout or concrete.

Specification of the intended use is presented in Annex B1. The performances given in Section 3 are only valid if the column shoe is used in compliance with the specifications and conditions given in Annex B.

Working life/durability

HELKA® column shoe is intended for a lifetime of the structure of 50 years when installed in the works provided that the is subject to appropriate installation. These provisions are based upon the current state of the art and the available knowledge and experience. The real working life may be, in normal use conditions, considerably longer without major degradation affecting the basic requirements for works[1].

This European Technical Assessment is based on the assumption that all plans needed have been made correctly according to the regulations valid on the building site. Special design rules are presented in TR 068.

[1] This means that it is expected that when this working life has elapsed, the real working life may be, in normal use conditions, considerably longer without major degradation affecting the essential requirements of the works. The indications given as to the working life of Column shoes cannot be interpreted as a guarantee given by the producer or the assessment body. They should only be regarded as a means for the specifiers to choose the appropriate criteria for Column shoes in relation to the expected, economically reasonable working life of the works.

3 Performance of the product and references to the methods used for its assessment

Table 1. Basic requirements for construction works and essential characteristics

Basic requirement and essential characteristics	Performance
BWR 1. Mechanical resistance and stability	
Resistance to tension and shear loads	Clause 3.1
BWR 2. Safety in case of fire	
Reaction to fire	Clause 3.2
Resistance to fire – steel temperature as a function of the duration of exposure	Clause 3.2

3.1 Mechanical resistance and stability, BWR 1

3.1.1 Resistance to tension and shear loads

The bending stiffness factor k_L, bending resistance factor η_d, shear resistance factor k_s and tension resistance $N_{Rd,S(shoe)}$ are given in Annex C.

3.2 Safety in case of fire, BWR 2

3.2.1 Reaction to fire

HELKA® column shoes are considered to satisfy the requirements for performance Class A1.

3.2.2 Resistance to fire – steel temperature as a function of the duration of exposure

The temperatures to be used in fire design in accordance with the relevant Eurocodes are given in Annex C.

4 Assessment and verification of constancy of performance (hereinafter AVCP) system applied, with reference to its legal base

For the products covered by this EAD the applicable European legal act is: 2000/606/EC

The system to be applied is: **2+**

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD.

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Eurofins Expert Services.

Issued in Espoo on August 5, 2024
by Eurofins Expert Services Oy

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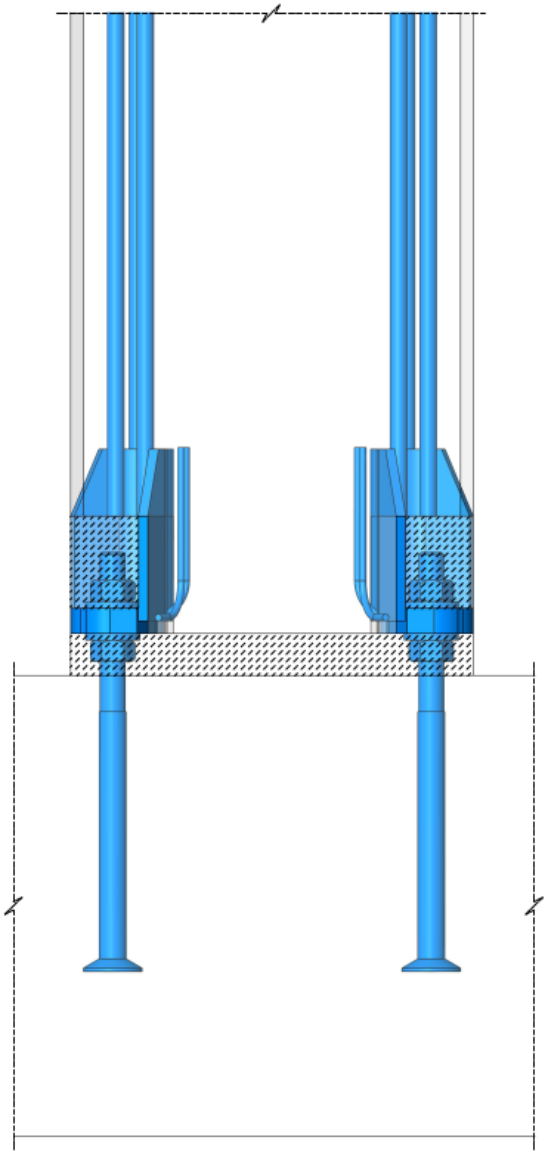


Figure A1. Application example

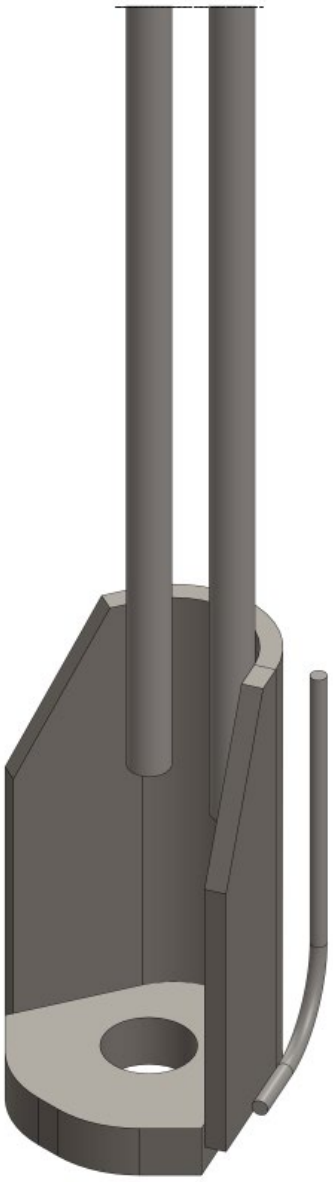


Figure A2. HELKA® Column Shoe

Peikko HELKA® Column Shoe	
Product description Application example	Annex A1

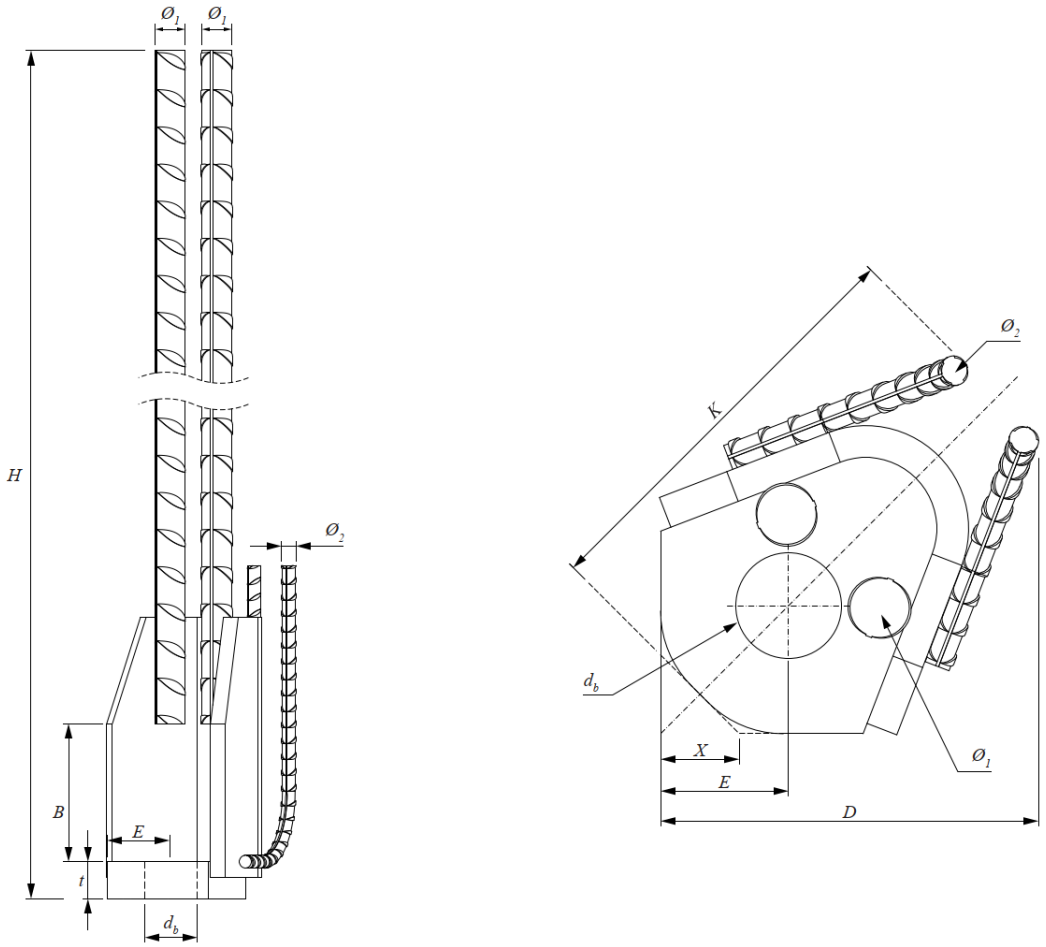


Figure A3. Dimensions of HELKA® Column Shoes

Table A1: Dimensions (All values are specified in mm units).

Column Shoe	HELKA® 24	HELKA® 30	HELKA® 39
H	878	1128	1592
t	20	30	40
B	100	110	130
E	50	50	60
d_b	34	40	54
ø 1	16	20	25
ø 2	6	8	10
X	30	30	37
D	112	137	169
K	112	141	170

Peikko HELKA® Column Shoe	Annex A2
Product description Dimensions	

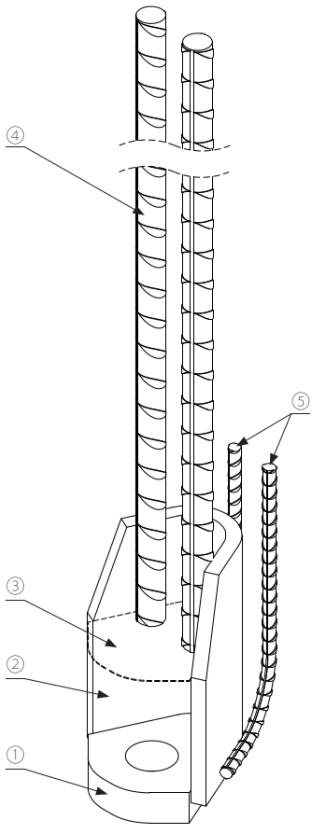


Figure A4. Materials of HELKA® Column Shoes

Table A2: Materials The steel plates and the fillet material shall meet the requirements of EN 10025:2019.

Item	Component	Steel	Optional Steel	Standards
1	Base plate	S355J2+N	S355K2+N; S420J2+N	EN 10025:2019
2	Side plate	S355J2+N	S355K2+N; S420J2+N	EN 10025:2019
3	Top plate (option)	S235JR	DC01	EN 10025:2019, EN 10130:2006
4	Anchor bar	Table A3	B500C	EN 10080:2005 and EN 1992-1-1:2004+AC10, Annex C
5	Rear bar	Table A3	B500C	EN 10080:2005 and EN 1992-1-1:2004+AC10, Annex C

Table A3. *Minimum requirements for reinforcing steel.*

General	All requirements set in EN 10080:2005 and EN 1992-1-1:2004+AC10, Annex C for the reinforcing steel of Class B or Class C, strength class 500 MPa
Additional	The steel shall be weldable

Peikko HELKA® Column Shoe	Annex A3
Product description Materials	

Specifications of intended use

Design value of loads

- Static and quasi-static load.
- Tension loads, compression loads, and shear loads or any combination thereof.

Anchoring base material

- The grade of the reinforced concrete used for the column shall be in the range C35/45 to C70/85 according to EN 1992-1-1:2004 + AC:2010.
- In the region of the HELKA® Column Shoes the concrete may be cracked or uncracked.

Use conditions (environmental conditions)

- Normal applications when HELKA® Column Shoes are installed normally to the concrete surface without any additional measures or surface treatments and when applications fall within the scope of the EN 1992-1-1:2004 + AC:2010 series. In applications where particular special aggressive considerations apply, e.g. marine environment or chemical exposure environment, modifications can be necessary.
- The European standard EN 1992-1-1:2004 + AC:2010, section 4 applies to HELKA® Column Shoes, that are planned to be installed with concrete cover.
- The lowest temperature in use is -20°C.

Design

- The dimensioning of column shoes is carried out under the responsibility of an engineer experienced in the field of structural design and concrete constructions.
- The design is based on the Technical Report TR 068: *Design of Structural Connections with Column Shoes*.
- Verifiable calculations and construction drawings shall be made by taking into account the actions to be transferred.
- The position of the column shoes including the reinforcement required according to Annex C has to be specified on the construction drawings and execution specifications.
- The splice laps between main reinforcement bars and anchor bars of HELKA® Column Shoes are designed according to the EN 1992-1-1:2004 + AC:2010.
- The dimensioning and design of connected structural concrete members shall be done according to the EN 1992-1-1:2004 + AC:2010.
- The load bearing resistances of the column connections with HELKA® Column Shoes under fire exposure is based on the Technical Report TR 068: *Design of Structural Connections with Column Shoes*.

Peikko HELKA® Column Shoe	Annex B1
Intended use Specifications	

Installation

- Installation of the HELKA® Column Shoes in accordance with Technical Manual of HELKA® Column Shoes is carried out by appropriately qualified workers under the supervision of the person responsible for technical matters on site.
- Usage of the HELKA® Column Shoes as supplied by the manufacturer without any manipulations, repositioning or exchanging of the components.
- Installation of the HELKA® Column Shoes in accordance with the manufacturer's specifications given in Annex B3 and Technical Manual of HELKA® Column Shoes
- HELKA® Column Shoes have to be fixed to the formwork so that no movement occurs during the time of laying the main and supplementary reinforcement and casting and compacting the concrete.
- Correct and proper compaction of the concrete in the area of the HELKA® Column Shoes.
- The HELKA® Column Shoes have to be protected against penetration of concrete, water and oil.
- The spacing and clear distances between HELKA® Column Shoes must be selected according to EN 1992-1-1:2004 + AC:2010 and shall be such that the concrete can be placed and compacted satisfactorily for the development of adequate bond.
- Examples of spacings and arrangements of HELKA® Column Shoes are given in Fig. B1 and Table B1.
- The HELKA® Column Shoes may be used in any cross section of concrete columns, for example: square, rectangle, L-form, oval and circle.

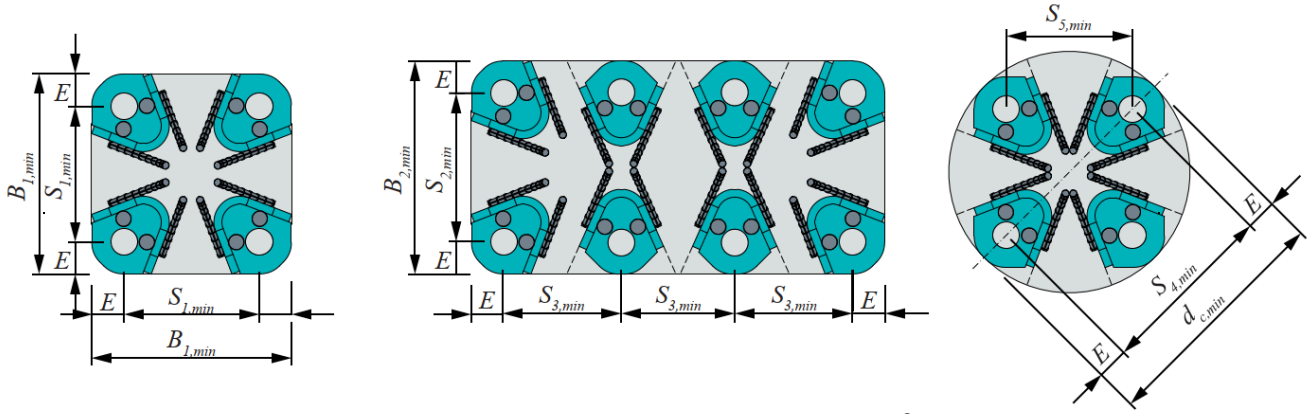


Figure B1. Examples of geometries and minimum spacings of HELKA® Column Shoes

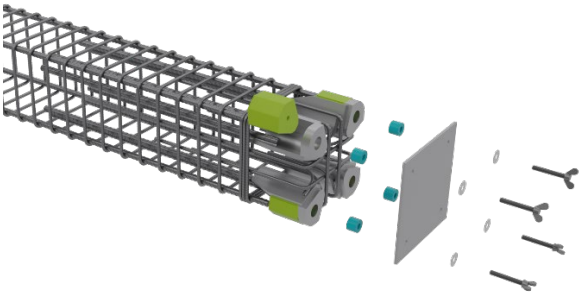
Table B1: Minimum distances (All values are specified in mm units).

Column Shoe	HELKA® 24	HELKA® 30	HELKA® 39
$B_{1,min}$	225	275	340
$B_{2,min}$	230	285	345
$S_{1,min}$	125	175	220
$S_{2,min}$	130	185	225
$S_{3,min}$	120	150	200
$S_{4,min}$	177	247	311
$S_{5,min}$	125	175	220
E	50	50	60
$d_{c,min}$	277	348	431

Peikko HELKA® Column Shoe	
Intended use Installation and spacing parameters	Annex B2

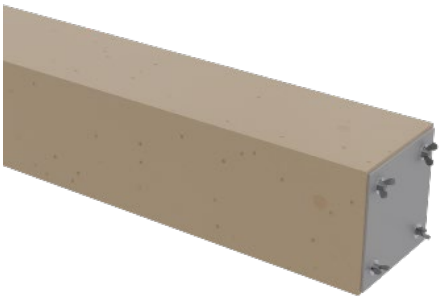
Installation instructions

1. Positioning



1. The HELKA® Column Shoes are placed into the reinforcement of the column into planned location and fixed through the holes of their base plates to the end plate of the formwork with recess boxes and wing screws.
2. Supplementary reinforcement must be placed at the area of column base, according to drawings.
3. Fasten and tie the anchor bars of the HELKA® Column Shoes to the main reinforcement of column.

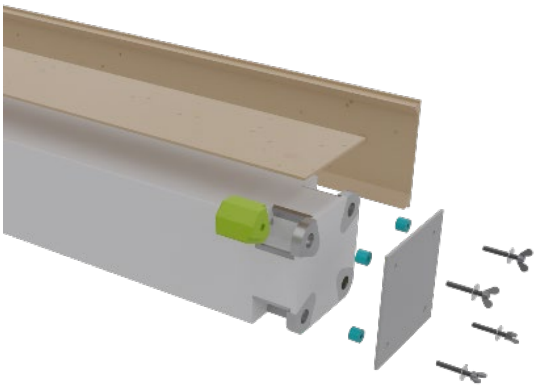
2. Casting and compacting



1. Carefully pour in concrete paying attention to built-in HELKA® Column Shoes and reinforcements
2. Compact concrete properly, avoid contact between vibrating device and HELKA® Column Shoes and reinforcements.

   → Do not move or damage HELKA® Column Shoes

3. Removal from formwork

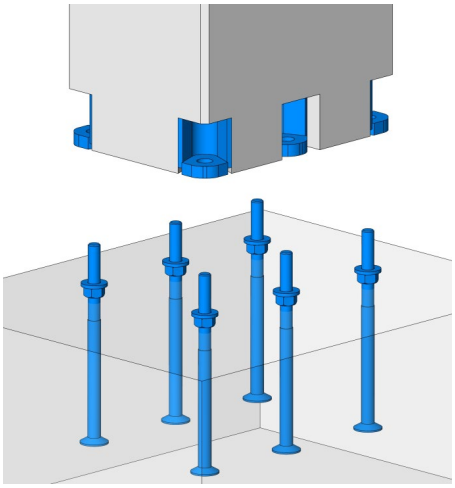


1. Loosen the wing screws of the HELKA® Column Shoes.
2. Remove formwork.
3. Check the adjacent concrete for gravel pockets etc.
4. Remove the concrete slurry on the column shoes.

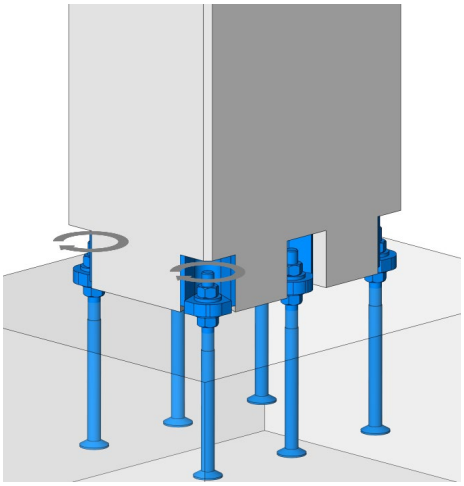
Peikko HELKA® Column Shoe	Annex B3
Intended use Installation instructions	

Installation instructions - precast element

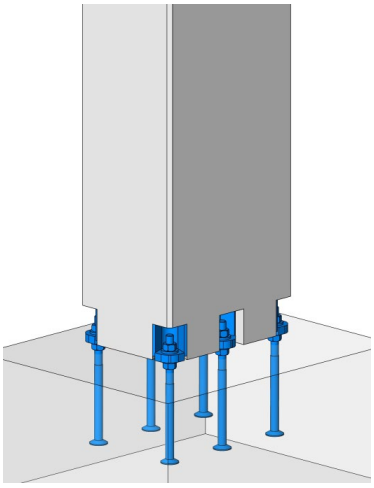
1. Column is installed directly on the pre-leveled washers and the lower nuts



2. Upper washers are installed on the base plate and upper nuts are screwed on the bolts

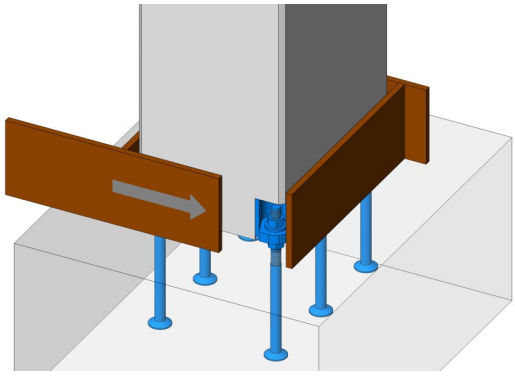


3. After the upper nuts are tightened, the crane hook and lifting slings can be released

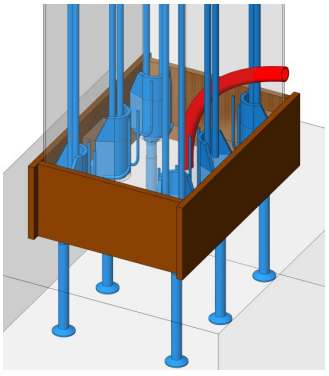


NOTE ! Joint has to be grouted with non-shrink mortar (grout) and grout has to reach the designed strength before the column is loaded by other structures.

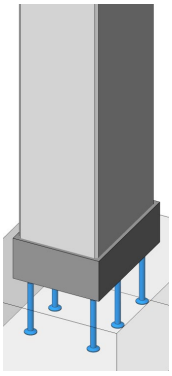
4. Install formwork for grouting joint and recesses, joint has to be grouted with non-shrink mortar (grout)



5. Alternative (filling pipe for grouting) where grouting is aligned with column face



6. The finalized connection after grouting has hardened



Peikko HELKA® Column Shoe	
Intended use Installation instructions	Annex B4

Table C1-1: Resistances to tension and compression under static and quasi-static loading

Steel failure			HELKA® 24	HELKA® 30	HELKA® 39
Minimum column size			**225x225**	**275x275**	**340x340**
Resistance	$N_{Rd,s}$	[kN]	139	220	383
Bending resistance factor	η_d	[-]	1,00		
Bending stiffness factor	k_L	[-]			

Table C1-2: Resistance to shear under static and quasi-static loading

Steel failure			HELKA® 24	HELKA® 30	HELKA® 39
Minimum column size			**280x280**	**320x320**	**370x370**
Shear resistance factor	k_s	[-]	1,00		

Note:
Laps with the welded reinforcing steel bars (Pos. 4 according to Annex A3) are designed according EN 1992-1-1:2004+AC10.

Table C2: Steel temperature timetable under fire exposure - $T_{cr}(t_i)$ [°C]

Time	HELKA® 24	HELKA® 30	HELKA® 39
t_i [min]	Min. column size 280x280 mm²	Min. column size 320x320 mm²	Min. column size 370x370 mm²
30	194	245	137
60	477	487	364
90	675	648	549
120	813	763	669